Drycleaner Site Profiles

Former Big B Cleaners, Warrington, FL

Site Description

Drycleaning was conducted at this facility from 1972 until 1978. The facility was located in a strip shopping mall in a mixed commercial/residential setting. A laundromat that ran a coin-operated perchloroethylene (PCE) drycleaning machine was located in the same strip mall.

In 1977, a valve failed on an above-ground storage tank (AST) that contained perchloroethylene (PCE) at the Big B facility, releasing approximately 275 gal of PCE. In 1983, PCE was detected in a public water supply well located approximately 400 ft hydraulically downgradient of the facility. Wellhead treatment (granular activated carbon) has been installed at the water supply well.

A consulting firm conducted a contamination assessment and installed a 3-well groundwater pump-and-treat system for the property owner. The system operated from 1993-1995 and treated approximately 8 million gal of water. The site became eligible for the Florida Drycleaning Solvent Cleanup Program in 1997.

Site Hydrogeology

Depth to ground water: 8 ft bgs

Lithology/subsurface geology:
Shallow Zone: very fine to medium-grained sand, 0-77 ft bgs
Low Permeability Zone: very fine to fine-grained sands interbedded with clays and sandy clays, 77-195 ft bgs;
Main Producing Zone: fine to coarse sand with some clay lenses, 195-228 ft bgs

Conductivity: Shallow Zone 32.3 ft/day; Low Permeability Zone 3.3 ft/day; Main Producing Zone 70 ft/day

Gradient: Shallow Zone 0.0035 ft/ft; Low Permeability Zone 0.001 ft/ft; Main Producing Zone 0.007 ft/ft

Groundwater Contamination

Contaminants present: PCE

Highest contaminant concentrations: 76,000 µg/L (PCE)

Deepest significant ground-water contamination: > 200 ft bgs

Plume size: 2,650 ft x 1,100 ft (defined to MCL)

DNAPLs present: Given the large solvent discharge that occurred at the facility in 1977 and the high contaminant concentrations in groundwater (representing over 50% of the aqueous solubility of PCE), it is likely that DNAPL is present.

Soil Contamination

Contaminants present: PCE

Highest contaminant concentrations: 5,600 mg/kg (PCE)

Description of Remediation Scenario

Cleanup goals: Groundwater (MCL): PCE = 3 µg/L
Soils - Leachability-based levels (SCTLs): PCE = 30 µg/kg

Technologies Used:
Dual-phase Extraction

Any other technologies used:

Why was technology or technologies selected: Dual-phase extraction is a cost-effective remedy to remove volatile organic compounds (VOCs) from the unsaturated zone and the shallow portion of the aquifer at the site. Operation of a groundwater recovery well lowered the groundwater table in the contaminant source area allowing recovery of contaminants from the smear zone.

Date Implemented: March 1, 2000

Final Remediation Design: The remedial design consisted of two soil vapor extraction (SVE) wells installed in horizontal trenches 1.5 ft in depth and one groundwater capture well. The groundwater treatment system was a packed tower air stripper. Residual VOCs were treated with a granular activated carbon system.

Recovery Well: screened 3-38 ft bgs
Pumping rate: (design) 10 gpm
Radius of influence: (design) 59 ft

2 SVE Wells: screen length 10 ft
Vacuum: 73 inches of water
Air flow rate: 101.9 cfm
Radius of influence: 58 ft

Results

The remedial system operated for 8.25 months (March-August 2000 and November-January 17, 2001). An estimated 214.6 lbs of PCE were removed

from the unsaturated zone. The SVE influent PCE concentrations fell from 3,100 mg/m3 at startup to 2.8 mg/m3 at shutdown. Confirmatory soil sampling detected PCE in only five of 14 soil samples. Only one soil sample had a PCE concentration exceeding the SCTL. This sampling point is located on the outside edge of the SVE radius of influence.

The dewatering and containment system recovered approximately 889,795 gal of impacted groundwater and 1.15 lbs of PCE mass from the shallow portion of the surficial aquifer. PCE influent concentrations appeared to go asymptotic with time, indicating that a significant source does not exist in the shallow surficial aquifer under the facility floor slab.

The dual-phase extraction system was shut down in January of 2001 since PCE influent concentrations had substantially decreased and the building housing the equipment was scheduled for demolition as part of site remodeling. The contractor is currently developing a Remedial Action Plan for in situ chemical oxidation utilizing hydrogen peroxide to treat contaminated groundwater in the contaminant source area at depths of from 40-115 ft bgs. Continued groundwater recovery and capture from the nearby municipal well will serve to remediate contaminated groundwater below Natural Attenuation Default Concentrations.

The selected remedy for deeper groundwater contamination at the site is chemical oxidation using hydrogen peroxide. The bulk of the contaminant mass in groundwater occurs at from 40-115 ft bgs. Hydrogen peroxide injection has not yet occurred.

Costs

Site assessment: $ 47,389

Design and implementation: $ 61,000

O&M: $ 54,400

System Closure $ 19,300

Total costs (only completed sites):

Lessons Learned

1. Dual-phase extraction is effective for removing contaminants from the soils and shallow groundwater.
2. An abandoned building bay was used to house the treatment system.
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Site Specific References

HSA Remediation Performance Report-Final Quarter-2/15/01
HSA SVE Summary Closure Report-2/01
HSA Groundwater Monitoring Report-6/00 and 6/01
HSA Intermediate Remedial Action Plan-2/10/99

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This profile last updated: January 23, 2002

Drycleaner Site Profiles

Former Sta-Brite Cleaners, Sarasota, FL

Site Description

Drycleaning using perchloroethylene (PCE) was conducted at this site from 1987 until early 1995. The site is located in a commercial/industrial setting with auto repair businesses, service stations, and another drycleaner located within 700 ft of the site. The nearest public water supply well is located approximately 1,850 ft west of the site.

The contaminant source areas are the soils beneath the building floor slab near the former location of the drycleaning machine and the service door at the rear of the building.

Site Hydrogeology

Depth to ground water: 4 ft bgs

Lithology/subsurface geology:
Silty, fine-grained sand, 0-19 ft bgs;
Dense clay, 19-34 ft bgs

Conductivity: 10.5 ft/day

Gradient: 0.0014 ft/ft

Groundwater Contamination

Contaminants present: PCE, trichloroethylene (TCE), dichloroethylene (cis 1,2-DCE, trans 1,2-DCE, and 1,1-DCE), vinyl chloride, dichloroethane (1,1-DCA), benzene, toluene

Highest contaminant concentrations: 33,700 µg/L (PCE), 1,180 µg/L (TCE), 1,920 µg/L (cis 1,2-DCE), 30.6 µg/L (trans 1,2-DCE), 3.3 µg/L (1,1-DCE), 2.8 µg/L (vinyl chloride)

Deepest significant contamination: PCE and TCE at 19 ft bgs

Plume size: 140 ft x 340 ft (defined to MCLs)

DNAPLs present: PCE concentrations in groundwater representing over 22% of the aqueous solubility of PCE indicate that DNAPL is likely.

Soil Contamination

Contaminants present: PCE, TCE

Highest contaminant concentrations: 36,600,000 µg/kg (PCE), 72 µg/kg (TCE)

Description of Remediation Scenario

Cleanup goals:
Groundwater (MCLs): PCE= 3.0 µg/L, TCE= 3.0 µg/L, cis 1,2-DCE= 70 µg/L, trans 1,2-DCE= 100 µg/L, Vinyl chloride= 1.0 µg/L
Soils (Leachability-based levels): PCE= 30 µg/kg, TCE= 30 µg/kg

Technologies Used:
Multi-phase Extraction

Any other technologies used:

Why technology or technologies selected: Multi-phase extraction utilizing a high-vacuum liquid ring pump was selected to remove contaminants in the unsaturated zone and the smear zone. There is a shallow water table at the site, the soils/sediments are permeable and the contaminants are volatile organic compounds (VOCs). Operation of the multi-phase extraction system will expose the smear zone allowing for removal of contaminants from both the unsaturated zone and the uppermost portion of the saturated zone.

The proposed remedies for contaminated groundwater at the site are biosparging and pump and treat. These remedies have not yet been initiated.

Date Implemented: June 2001

Final Remediation Design: : The plan divides the remediation site into two areas: #1 is the location of the dumpsters, and #2 is located under the building at the source. No pilot test was conducted. Following is the design for full-scale remediation:

Recovery wells: 8
Depth: 17-19 ft bgs (screened from 2 ft bgs to total depth)
Vacuum (max.): 24 inches mercury
Design radius of influence: 30 ft
Design vacuum: 10 inches high
Design airflow rate: 70 cfm
Operation duration: 6-12 months

Impacted groundwater will be addressed in a supplemental phase.

Results

An estimated 150 lbs of contaminant mass were removed during the first three months of operation.

Costs

Site assessment: $122,000

Design and implementation:
$130,000
$8,339 (Monitoring)

O&M: $48,160

Total costs (only completed sites):

Lessons Learned

1. Discharging treated water to the POTW resulted in substantial savings in operating costs.
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Site Specific References

HSA Contamination Assessment Report-9/98
HSA Phase I Remedial Action Plan-4/01

Contacts

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Drycleaner Site Profiles

Johannsen Cleaners, Lebanon, OR

Site Description

Johannsen Cleaners began operations in 1955. In 1990, perchloroethylene (PCE) contamination was discovered in an irrigation well in the area. Additional sampling over the next few years found PCE contamination in a number of private and domestic wells. From 1993-1995 work at the site indicated soil and groundwater contaminated with PCE.

In late 1998, high levels of PCE soil contamination (to 68 mg/kg) were detected at the rear of the building and beneath the building along the sewer lines. In June 1999, approximately 37 tons of contaminated soil was removed and transported to a hazardous waste landfill. Excavation was to a depth of approximately three feet below the ground surface; a deeper excavation was not possible due to the proximity of the dry cleaner building and several power poles in the vicinity. Confirmation samples collected from the bottom of the excavation indicate that remaining soil concentrations range to 35 mg/kg in the center of the excavation.

Site Hydrogeology

Depth to groundwater: 10-15 ft. bgs.

Lithology/subsurface geology: Alluvium containing gravel and sand with varying amounts of silt and clay. Silty sand, 20-40 ft (upper surficial aquifer)

Conductivity:

Gradient: 0.001 ft/ft (downward) The average gradient between the shallow and deep aquifers in well clusters is about 20 times greater than the horizontal gradient in either aquifer.

Groundwater Contamination

Contaminants present: PCE, trichloroethylene (TCE), cis 1,2-dichloroethylene (cis 1,2-DCE), vinyl chloride (VC)

Highest contaminant concentrations: 3,400 mg/L (PCE), 42 mg/L (TCE), 41 mg/L (cis 1,2-DCE), 2.7 µg/L (VC)

Deepest Contamination: ~120 feet below ground surface (bgs.) in deeper drinking water aquifer. Full characterization not yet available.

Soil Contamination

None reported

Description of Remediation Scenario

Technologies Used:
Air Sparging
Air Stripping
Bioremediation
Pump and Treat
Multi-phase Extraction

Cleanup goals:

Remediation technology or technologies used: Multi-phase Extraction

Why technology or technologies used:

Final remediation design: System consists of two horizontal headers with vertical wells to the groundwater table. System removes soil vapor and groundwater from beneath the building slab. Soil vapor and groundwater are treated via air stripping and/or direct discharge to the atmosphere.

Results

Discharge Vapor: 14,000-180,000 µg/m3
Discharge water: ~1,000 µg/L

Costs

Site Assessment:

Design and Implementation:
System design - $ 15-25,000
Build/install - $45-60,000

O&M:

Total Costs: $ 230,000

Lessons Learned

1. Sewer discharge pipe ruptured. Need for upgrade/construction not realized.

2. Piping runs beneath flooring provided ideal access points to measure vacuum effect of treatment system.

3. 20/20 hindsight. Based on other sites, money may have been better spent on alternative cleanup/remediation (e.g HRC, bioremediation) rather than active treatment. However, at the time, HRC was not recommended in a DNAPL zone (1% rule of thumb) and other delivery methods proved problematic.

Site Specific References

Not Provided

Contacts

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This profile last updated: November 26, 2001

Drycleaner Site Profiles

Koretizing Cleaners, Jacksonville, FL

Site Description

This is an active PCE drycleaning facility that began operations prior to 1981. The facility is served by a septic system and an underground storage tank (UST) containing fuel oil is located behind the facility. The facility is located in a mixed commercial/
residential setting. The nearest public water supply well is located approximately 2,000 ft northeast of the facility. The contaminant source area outside the service door where wastes used to be discarded and the septic tank/drainfield.

Site Hydrogeology

Depth to ground water (bgs): 5 ft bgs

Lithology/subsurface geology: Fine-grained sand, 0-7 ft bgs;
Clayey fine-grained sand grading to sandy clay, 7-15 ft bgs;
Stiff clay 15-26 ft bgs

Conductivity (ft/day): 10/ft/day

Gradient (ft/ft): 0.02 ft/ft

Groundwater Contamination

Contaminants present: PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, vinyl chloride

Highest contaminant concentrations: 23,000 µg/L (PCE), 9080 µg/L (TCE), 9123 µg/L (cis 1,2-DCE), 7.0 µg/L (trans 1,2-DCE), 941 µg/L (vinyl chloride)

Deepest significant ground-water contamination: PCE and TCE at 12 ft bgs

Plume size: 100 ft x 280 ft (~0.17 acres as defined by regulatory MCLs)

DNAPLs present: PCE concentrations in groundwater represented approximately 15% of the aqueous solubility of PCE, indicating that residual DNAPL was likely present. During construction activities, a septic tank containing DNAPL PCE was located. The septic was emptied and cleaned.

Soil Contamination

Contaminants present: PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, vinyl chloride

Highest contaminant concentrations: 56,300 µg/kg (PCE), 2,050 µg/kg (TCE), 3,900 µg/kg (cis 1,2-DCE), 41 µg/kg (trans 1,2-DCE), 1,400 µg/kg (vinyl chloride)

Description of Remediation Scenario

Cleanup goals:
Groundwater (MCLs):
PCE= 3.0 mg/l, TCE=3.0 mg/l, cis 1,2-DCE=70mg/l
trans 1,2-DCE=100 mg/l, Vinyl chloride=1.0 mg/l

Soils (Leachability-based levels):
PCE=30 mg/kg, TCE=30 mg/kg, cis 1,2-DCE=400 mg/kg, trans 1,2-DCE=700 mg/kg, Vinyl chloride=7 mg/kg

Technologies Used:
Multi-phase Extraction

Why technology or technologies selected: Multi-phase extraction was selected as the remedial technology at this site because of the shallow depth of the contaminants; the relatively small plume size and the space constraints at the site. An Interim Remedial Measure for source removal consisted of cleaning out contaminated sludges and wastewater from the facilities septic tank.

Date Implemented: March 7, 2001

Final Remediation Design: A multi-phase extraction system was designed to extract water and soil vapor from extraction wells located in the source area and the dissolved-phase plume immediately downgradient of the source area. Soil vapors are treated using granular activated carbon and extracted groundwater will is treated using a low-profile air stripper. Following are the design specifications:
Recovery wells: 7 Monitoring wells: 5

Groundwater Recovery: Soil Vapor Recovery:
Flow rate: 2 gpm Air flow rate: 175 scfm
1st month volume recovered: 106,000 gal. Estimated radius of influence 25 ft
Stripper air flow rate: 150 scfm

Results

Through the end of October, 2001, chlorinated ethene concentrations in groundwater decreased by approximately 2 orders of magnitude. Contaminant concentrations in groundwater are below natural attenuation default concentrations at most of the monitoring wells at the site. The total mass of contaminants that has been removed by the system is 24.1 lbs. Most of this removal was from the unsaturated zone. Concentrations of chlorinated ethenes in soil vapor discharges decreased by 1.5-2 orders of magnitude during the first month of operation.

Costs

Site assessment: $96,000

Design and implementation:
Remedial Action Plan $30,000
Multi-phase System Capital
Costs Installation and
Construction $150,000
System Startup & Reporting $35,000
IDW Source Removal (septic
tank cleanout) $30,000

O&M: $100,000 (annual monitoring & reporting)

Total costs (only completed sites):

Lessons Learned

1. Location of potential DNAPL source areas, e.g. DNAPL-contaminated septic tanks and drainfields, are critical to assessment, design, and remediation.
2. Multi-phase extraction is effective for removing contaminants from the soils and shallow groundwater.
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Site Specific References

1. LFR Contamination Assessment Report-12/15/97
2. LFR Remedial Action Plan-9/6/00
3. LFR Source Area Investigation-6/16/00
4. Dual Phase Extraction Remediation System Construction Completion and Startup Report-6/22/01

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This profile last updated: January 17, 2002

Drycleaner Site Profiles

NuWay II Cleaners, --, OR

Site Description

NuWay II Cleaners, an inactive facility located in a mixed commercial and residential area, operated between 1953 and 1976. Minimal documentation of storage, handling and disposal practices at the facility exist. It is known that NuWay II recycled solvents on site.
Oregon Department of Environmental Quality (DEQ) initiated a site investigation in 1996, and identified significant chlorinated solvent contamination in the groundwater. The DEQ transferred the site to the Department's Orphan Site Account program to conduct further investigation and remedial activity. The DEQ has implemented an Interim Removal Action Measure (IRAM) to contain the chlorinated hydrocarbon plume and recover free-phase Stoddard solvent. The DEQ will select a final remedy upon completion of the Risk Assessment and Feasibility Study.

Site Hydrogeology

Depth to ground water: 7.5-9.2 ft. bgs. to shallow gravel unit; 80 ft. bgs. to a regional confined aquifer

Lithology/subsurface geology: Silty clay, grade-7 ft. bgs. underlain by silty gravel, 13-16 ft. thick.
Silty clay, about 30 ft. thick (behaves as the local confining unit and limits downward migration of the contaminants) underlain by clayey gravel, about 25 ft. thick, which also is a confining layer.

Conductivity: 0.28-0.0028 ft/day

Gradient: About 0.01 ft/ft

Groundwater Contamination

Contaminants present: perchloroethylene (PCE), trichloroethylene (TCE), vinyl chloride (VC), and Stoddard Solvent

Highest contaminant concentrations: 3,610 µg/L (PCE), 5,610 µg/L (TCE), 160 µg/L (VC), 468 µg/L (free-phase Stoddard Solvent)

Deepest significant ground-water contamination: Not reported

Plume size: Nuway II represents one of many sources contributing to a PCE plume about one mile long by one mile wide; extent of Nuway's contribution unknown.

DNAPLs present: Although no DNAPLs have been detected or observed at the site, extremely high concentrations of chlorinated compounds may indicate the presence of DNAPL. Groundwater sampling events reveal PCE concentrations exceeding 1% saturation for pure-phase PCE.

Soil Contamination

Contaminants present: None reported

Highest contaminant concentrations: None reported

Description of Remediation Scenario

Technologies Used:
Groundwater Extraction
Air Stripping
Carbon Adsorption
Pump and Treat

Cleanup goals: Interim Remedial Action Measures (IRAM) objectives include the containment and minimization of further migration of VOC contamination. The DEQ seeks to remove the contaminant mass from the source area and protect or mitigate threats to human health or the environment until it selects the final remedy. DEQ will establish groundwater cleanup levels as part of the site-specific risk assessment process.

Remediation technology or technologies used: Groundwater Extraction

Why technology or technologies selected: DEQ identified the groundwater extraction system as a means to hydraulically contain the plume while site investigation activities continue.

Final remediation design: The groundwater treatment system includes one, light non-aqueous phase liquid (LNAPL) extraction well and one groundwater extraction well operating at 10-15 gal./min. An oil/water separator, air stripper, and carbon adsorption serve to treat the contaminated groundwater. Contractors discharge treated effluent through a sanitary sewer to a local POTW via a wastewater discharge permit.

Results

The treatment system has thus far removed approximately 40 pounds of VOCs and approximately 50 gal. of petroleum hydrocarbons. The treatment system has been 99% effective for removal of LNAPL, and air stripping has been 94% effective in removing VOCs.

The IRAM has been in operation for approximately three years. The DEQ will select a final remedy upon completion of the Risk Assessment and Feasibility Study.

Costs

Site assessment: $300,000

Design and implementation: None (MNA)

O&M: $10,000/year

Total costs:

Lessons Learned

1. Discharge to the City sanitary provided easy disposal of treated water. The system influent has frequently been below the acceptable discharge concentration set by the City, which may have resulted in lower O & M costs via direct discharge. A downside would be that the contaminant mass load would then have been passed to the local POTW.
2. Simple LNAPL skimmer type pumps are effective for not only removing free product accumulation of Stoddard Solvent, but when utilized in a low producing aquifer formation, they provide adequate capture zones and minimal O & M.
3. 3. Rather than containerizing the groundwater extraction system, contractors built it in open air and placed it behind concrete blocks. Significant weather related failures caused system shut downs. Containerized system would have been preferable also because it could be used again in the future at different sites.
4. Cost savings could have been realized with a NPDES permit waiver. The monthly fees to discharge treated effluent to the POTW exceed the cost incurred with a permit exemption.
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Site Specific References

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Contacts

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